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08/880,616	06/23/1997	MITCHELL ADAM COHEN	YO997-111	2216

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EXAMINER
FOURSON, GARY SCOTT

ART UNIT	PAPER NUMBER
2151	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 08/880,616	Applicant(s) Cohen et al.
	Examiner Gary Fourson	Art Unit 2151

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on *Jan 3, 2002*

2a) ☒ This action is **FINAL.** 2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *1-14 and 16-20* is/are pending in the application.

4a) Of the above, claim(s) _____ is/are withdrawn from consideratio

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) *1-14 and 16-20* is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claims _____ are subject to restriction and/or election requirement

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

a) ☐ All b) ☐ Some* c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

15) ☒ Notice of References Cited (PTO-892)

16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____

18) ☐ Interview Summary (PTO-413) Paper No(s). _____

19) ☐ Notice of Informal Patent Application (PTO-152)

20) ☐ Other:

DETAILED ACTION

1. This final rejection is responsive to Amendment, part of paper no. 21, with certificate of mailing dated January 3, 2002. Claims 1-14 and 16-20 are pending.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1, 11, 12, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Boland et al. (5,872,972) in view of Admitted Prior Art (Applicant's Specification page 2 line 20 through page 3 line 7).

With respect to claims 1 and 11, Boland et al. teaches a plurality of tasks (processes) of more than one application (col 4 line 19, "all runnable processes in global run queue 24, ..."), computing nodes (col 3 line 52; Figure 5), a plurality of local processes (col 4 line 21, "processes which have been previously run and are now affinitized to a specific processor." Col 4 line 59, "once a processor runs a process, it would never age away its affinity from that processor."), providing application information to global scheduler means (The scheduler 90 obviously takes information from applications or processes to schedule the processes into the global priority queue. In column 3 lines 1-5 processes provide affinity information to the scheduler.), and dynamically creating a schedule of a plurality of tasks utilizing priorities (col 4 lines 22-24), and a local scheduler comprising means for receiving said global prioritized schedule (Column 4 lines 26-31 teach that each 'processor' consults the global queue.) as well as means to update a local priority list to include said assigned processes (Referring to

Figure 7, column 7 lines 26-28, "These processes may thereafter be reordered based upon process priority within a nodal priority run queues 71 and 77 ..."). Although, Boland does not explicitly refer to the runnable processes in column 4 lines 16-25 as being from a plurality of applications, the scheduling of multiple processes as described by Boland would indicate to one of ordinary skill in the art that the multiple processes arise from a multiplicity of applications. One would not be inclined to conclude that the multiplicity of processes are merely due to multiple instances of the same application/program.

As to means for prioritizing the processes according to the prioritized schedule (Applicant has divulged on pages 2-3 that the AIX™ operating system assigns a common priority to the process(es) required for (or correlated to) a task. As to the claimed limitation of means for ascertaining which process(es) are assigned to the tasks, Unix threads/tasks are inherently correlated to the process execution space provided by the scheduling and/or operating system. Applicant admits that the process is correlated to a task in the prior art AIX™ operating system. Having the processes, associated with individual tasks, assigned priorities corresponding to the priorities of the schedule would have been a highly desirable feature in the art. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the local scheduling/correlating means of IBM into the task scheduling system of Cameron et al., because prioritizing local processes according to the task correlation would have been expected to result in higher cache preloading efficiency.).

As to **claims 12 and 14**, invoking operating system priorities to schedule tasks in accordance with said prioritized schedule: The operating system would inherently follow any prioritizing scheme employed by the programmer or else there would not be any need to incorporate the local/global scheduling means in the first place.

4. Claims 2, 4-10, 13, 14, 16, and 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Boland et al. (5,872,972) in view of Admitted Prior Art (Applicant's Specification page 2 line 20 through page 3 line 7), and further in view of Cameron et al. (5,325,526).

As to **claim 2**, said computing node comprising an operating system for "receiving input" from the prioritizing means and "directing said assigned processes" to execute tasks in a prioritized order: Cameron et al. in Figures 4 and 5 show a prior art task scheduler. Column 5 last paragraph elaborates stating that each scheduler comprises operating system software responsible for controlling the execution of a plurality of tasks. It would have been obvious to one ordinarily skilled in the art at the time the invention was made for the OS to receive information about the execution of the plurality of tasks as taught by Cameron et al. with the task scheduling system of Boland et al., because Cameron et al. states in column 6 lines 28-31, "Interactive scheduling using Unix, or other operating systems in a single processor environment, is well known to those of ordinary skill in the art."

As to **claim 4**, application coordinator means for communicating information to said scheduler: Scheduling information must inherently be obtained by some means in order to produce a prioritized list of tasks, however in column 8, Cameron et al. teaches on line 2, "The allocator and scheduler 710 comprises processing logic and data for allocating nodes to specific application programs and for scheduling applications programs for execution." The "Make Partition" procedure (720) is the request for the allocator/scheduler to initialize tasks which as stated on line 18, "are retrieved and loaded into the nodes associated with the specified partition."

As to **claim 5**, said local processes being adapted to perform tasks in parallel: Also, in column 2 on line 50 Cameron teaches that application programs are allowed to

execute on one or more nodes of a partition. Furthermore, column 7 line 40 states, "...an entire application program is active at once across all of the nodes on which the application program is loaded." The multi-node or multi-processor collaborative effort to the processing of a set of tasks or application program processes is the truest definition of parallel processing. Cameron et al. in column 1 on lines 26 to 30 indicates that multi-tasking, round robin processing, time slicing, or parallel processing was well known to one of ordinary skill in the art at the time the invention was made.

As to **claim 6**, said scheduler means comprising global scheduler means which in turn comprises means for dynamically scheduling then communicating the schedule to the local scheduler: Cameron et al. teaches the local nodes are assigned to application programs. The allocator and scheduler 612 act functionally as a "global scheduler" by controlling and assigning the appropriate nodes from a particular layer. Column 7 line 50 states, "As will be described below, allocator and scheduler 612 may and typically does operate with a plurality of partitions 614." In column 9 on line 50, "In the preferred embodiment, partition data blocks and application data blocks can be maintained in the same doubly-linked list." Further down on line 64 it is stated that, "The current priority field 918 may dynamically change as the priorities of associated application programs or sub-partitions change priority." Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize means for dynamically scheduling then communicating the schedule to a local scheduler as taught by Cameron et al. with the task scheduling means of Boland, because Cameron et al. recognized, "The current priority field 918 may dynamically change as the priorities of associated application programs or sub-partitions change priority." [line 64]

As to **claim 7**, said local scheduler being adapted to communicate process information to the global scheduler: Cameron et al. teaches in column 14 lines 12-31

three access modes to the partition data. They are read, write, and execute access modes allowing or disallowing the ability to run application programs from a partition and to create or remove sub-partitions from a partition. This information is also available to the allocator/scheduler 710. Also, figure 7 shows application data 736 specifically available to the allocator/scheduler.

As to **claim 8**, the global scheduler also comprising timer means to effect schedule communication: Cameron et al. teaches in column 11 lines 6-11 a time executed field 1021.

As to **claim 9**, said global scheduler including a local scheduler address table: Cameron et al. teaches in column 13 lines 15-33, "Two hash tables providing a quick look-up mechanism for locating partitions ..."

As to **claim 10**, Boland et al. as modified by Admitted Prior Art (Applicant's Specification page 2 line 20 through page 3 line 7), and as further modified by Cameron et al. for the rejection of claims 1, 2, and 6 teaches the limitations as claimed.

As to **claim 13**, scheduler means is remote to the node and communicating the schedule to the node: Cameron et al. shows in Figures 4 and 5 that in prior art methods of task management systems, the Scheduler 410, 510 can be remotely located from the processors. In column 6 lines 32-45 refer specifically to Figure 5 noting that the scheduler arranges an orderly schedule for multiple tasks executing on multiple processors. Line 37 mentions a common memory where the schedule information would be communicated to the three processing nodes. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have scheduler means of Boland et al. as modified remote to the node as taught by Cameron et al., because Cameron et al. recognized mulitprocessor systems require global scheduling means remote from the majority of computing nodes.

As to **claim 16**, repeating said steps until all tasks have been completed: Cameron teaches recursive scheduling in column 15 on lines 12-14.

As to **claim 18**, said remotely located scheduler dynamically maintaining a computing node's list: Figure 7, Layer Data -738-; Column 9 lines 28-31, "The layer data structure 738 comprises information including identity of the nodes of the partition that are allocated by a list of consumers to which the layer points."

As to **claim 19**, the communicating and updating steps noted above as taught by Boland do not require user input, and, therefore, are automatically performed.

As to **claim 20**, Boland teaches receiving task information from an application coordinator [scheduler 90] and maintaining an activity scheduler list [The nodal run queues comprise processes previously run on a particular processor for which the data and instruction caches may have an affinity. See col. 4 lines 37-39] and an activity priority list [priority queues].

5. Claims 3 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Boland et al. (5,872,972) as modified by Admitted Prior Art (Applicant's Specification page 2 line 20 through page 3 line 7) and Cameron et al. (5,325,526) for claims 2 and 14 above, and further in view of Ripps (The Multitasking Mindset Meets the Operating System).

As to **claim 3**, the operating system being further adapted to interleave local operations with said tasks: A node or CPU controlled by an operating system would inherently process local operations (e.g. an exception) pertaining to the operating system commands. Ripps teaches on page 9 that C and proprietary OS functions are intermixed in a typical task. Context switches controlled by the operating system are also well known local tasks which are interleaved between the application task execution.

As to **claim 17**, Boland et al. as modified by Admitted Prior Art (Applicant's Specification page 2 line 20 through page 3 line 7), Cameron et al., and as further modified by Ripps for the rejection of claims 1, 3, 5, 11, 12, and 14 teaches the limitations substantially as claimed.

Pertinent Prior Art

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: Strout et al. (WO 92/03794) teaches coordinated multiprocessor scheduling in a UNIX environment comprising both a global gather queue (GQ) as well as user-side schedulers.

Response to Amendment

7. Applicant's arguments filed January 3, 2002 have been fully considered, but they are not persuasive. Applicant has presented the following arguments:

Applicant states on page 5 that in the teachings of Boland, "it is clear that there is no multinode environment" when on the previous page summarized the teachings of Boland as "an affinity-based distribution of work in a multiprocessor environment..." A multiprocessor environment implies multiple nodes as Applicant equates a node with a local execution element on page 4 of the instant specification. Boland illustrates multiple processors (or nodes as defined by Applicant) in Figure 1. Never-the-less, Boland explicitly refers to Figure 5 as illustrating multiple nodes (60, 62, 64, 66), each comprising a plurality of CPUs with corresponding cache memory. Therefore Examiner disagrees with Applicant's assertion that system described by Boland does not comprise a multinode environment, and Applicant is advised that they are responsible for the entire contents of the cited references as well as any relevant passages in addition to those cited by the Examiner should be addressed accordingly.

Applicant asserts that Boland fails to teach or suggest a local scheduler and noted in the Preliminary Amendment that by a local scheduler, Applicant meant that each node is capable of scheduling and executing multiple processes." [Amendment filed August 22, 2001, page 13]: Boland notes in the BACKGROUND OF THE INVENTION, col. 1, lines 27-30 that a processor's operating system's process scheduler is responsible for determining which processes run on which processor at any given point in time. Column 4 lines 26-31 as well as col. 7 lines 14-36 teaches each processor consults the global priority run queue when the processor becomes available. The existence of nodal run queues implies multiple processes queued for execution, thus, processor/nodal/local scheduling to process the queued tasks/processes, however Boland explicitly notes a process affinitized with a local processor will be scheduled in nodal run queue 76.

Applicant asserts that Boland fails to teach or suggest a local scheduler prioritized list. Column. 7 lines 25-29 [Boland] notes that processes may be reordered based upon process priority within nodal priority run queues (71 and 77). Nodal priority run queues as described by Boland are by definition a *prioritized* linked-*list* of processes.

Applicant asserts that Boland fails to teach or suggest communication of the global prioritized list to local nodes. Column 4 lines 26-31 as well as col. 7 lines 14-36 teaches each processor consults the global priority run queue when the processor becomes available, and the local scheduler compares priorities of processes on the global as well as local run queues in order to determine the process with the highest priority. This consultation, as broadly interpreted, teaches communication between global run queue and the local nodes' schedulers where the globally prioritized schedule is made available, consulted, and, therefore, communicated to the nodal run queues.

Applicant asserts that Boland fails to teach or suggest updating of a local prioritized list based on the global prioritized list and noted in the Preliminary

Amendment filed August 22, 2001 that re-ordering a queue and then providing a single next-up operation is not the same as providing a global prioritized schedule for use by the local scheduling entity. In column 7 lines 19-30, Boland teaches that the nodal priority run queues are updated with processes that have previously run on that particular node and that the processes may be reordered thereafter based upon process priority within the queues.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication should be directed to Gary Fourson at telephone number **(703) 305-4392**.

Communications via Internet e-mail regarding this application, other than those under 35 U.S.C. 132 or which otherwise require a signature, may be used by the applicant and should be addressed to: gary.fourson@uspto.gov

All Internet e-mail communications will be made of record in the application file. PTO employees do not engage in Internet communications where there exists a possibility that sensitive information could be identified or exchanged unless the record includes a

properly signed express waiver of the confidentiality requirements of 35 U.S.C. 122. This is more clearly set forth in the Interim Internet Usage Policy published in the Official Gazette of the Patent and Trademark on February 25, 1997 at 1195 OG 89.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is **(703) 305-3900**.

The fax numbers for Official (703-746-7239), to be intended for entry into the application, Non-Official/Draft (703-746-7240), or **After-final (703-746-7238)** communications may be utilized for expedited transactions.

gsf

March 20, 2002

ST. JOHN COURTENAY III
PRIMARY EXAMINER